CDM Smith

110 Fieldcrest Avenue, #8, 6th
Edison, New Jersey 08837
tel: 732-225-7000
fax: 732-225-7851

August 27, 2013

United States Army Corps of Engineers
Kansas City District
601 East 12th Street, Room 463
Kansas City, Missouri 64106-2896

ATTN:	CENWK-PM-ES/ Franklin
CONTRACT:	W912DQ-11-D-3004/Task Order 0005
PROJECT:	Lower Passaic River Restoration Project Remedial Investigation/Feasibility Study Oversight (RI/FS) Lower Passaic River Study Area, New Jersey
SUBJECT:	Quality Assurance Project Plan, Addendum #13 Chemical Water Column Monitoring Study/ Small Volume Collection Water Quality Monitoring for River Mile 10.9 Removal Action

Dear Ms. Vaughn:

CDM Federal Programs Corporation (CDM Smith) is pleased to submit this electronic copy of the Quality Assurance Project Plan, Addendum No. 13 for Oversight of the Remedial Investigation/ Feasibility Study, Chemical Water Column Monitoring Study/ Small Volume Collection Water Quality Monitoring for River Mile 10.9 Removal Action in support of the Lower Passaic River Restoration Project in the Lower Passaic River Study Area, New Jersey. This document is based on the CPG's *Lower Passaic River Study Area Quality Assurance Project Plan Remedial Investigation Water Column Monitoring/Small Volume Chemical Data Collection Addendum A, Water Quality Monitoring for the River Mile 10.9 Removal Action.*

If you have any comments concerning this submittal, please contact me at (703) 814-7325.

Very truly yours,
CDM FEDERAL PROGRAMS CORPORATION

Frank Tsang, P.E.
Project Manager

Attachment
cc: S. Vaughn, EPA
B. Sy, EPA
J. Czapor, CDM Smith (Letter Only)
S. Kirchner, CHMM, CDM Smith
S. Budney, CHMM, CDM Smith
J. Oxford, CHMM, CDM smith
G. Molnar, CDM smith
Project File

623564

Contract No.: W912DQ-11-D-3004
Task Order No.: 0005

US Army Corps. of Engineers
Kansas City District

Quality Assurance Project Plan, Addendum #13 Chemical Water Column Monitoring Study/ Small Volume Data Collection Water Quality Monitoring for the River Mile 10.9 Removal Action

Lower Passaic River Restoration Project

Remedial Investigation/Feasibility Study Oversight (RI/FS)

Lower Passaic River Study Area
New Jersey

August 27, 2013

CDM Smith

LOWER PASSAIC RIVER RESTORATION PROJECT
OPERABLE UNIT (OU) 2

Remedial Investigation/Feasibility Study Oversight

Quality Assurance Project Plan

Addendum No. 13

Chemical Water Column Monitoring Study/ Small Volume Data Collection
Water Quality Monitoring for the River Mile 10.9 Removal Action

Lower Passaic River Study Area, New Jersey

USACE CONTRACT No. W912DQ-11-D-3004

TASK ORDER No. 0005

August 27, 2013

Prepared for:
U.S. Army Corps of Engineers
Kansas City District

Prepared by:
CDM Federal Programs (CDM Smith)
110 Fieldcrest Avenue, 6th Floor
Raritan Center
Edison, New Jersey 08837

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Note:
Worksheets not included herein are included in the Physical Water Column Monitoring/Generic Final QAPP dated March 9, 2010.

Acronyms

%	percent
%D	percent difference
%R	percent recovery
µg/L	microgram per liter
A	analytical
ABS	absolute difference
ANSETS	Analytical Services Tracking System
ASC	analytical services coordinator
ASTM	American Society of Testing and Materials
Axys	Axys Analytical Services Limited
CA	corrective action
CAS	Chemical Abstract Service
CCV	continuing calibration verification
CD	compact disk
CDM Smith	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chain of custody
COPC	chemical of potential concern
CPG	Cooperating Parties Group
CRM	certified reference material
CRQL	contract required quantitation limits
CVAFS	cold vapor atomic fluorescence spectrometry
CWCM	Chemical Water Column Monitoring
DESA	Division of Environmental Science and Assessment
DL	detection limit
DOC	dissolved organic carbon
DQA	data quality assessment
DQI	data quality indicators
DQL	data quality level
DQO	data quality objectives
DV	data validation
EPA	United States Environmental Protection Agency
EQuIS	Environmental Quality Information System
FASTAC	Field and Analytical Services Teaming Advisory Committee
FID	flame ionization detector
FS	feasibility study
FTL	field task leader

GC/MS	gas chromatograph / mass spectroscopy
GPS	global positioning system
HCL	hydrochloric acid
HDPE	high density polyethylene
Hg	mercury
HRGC/HRMS	High Resolution Gas Chromatography / High Resolution Mass Spectrometry
HRGC/LRMS	High Resolution Gas Chromatography / Low Resolution Mass Spectrometry
ICV	initial calibration verification
IMDL	Inter-Laboratory method detection limit
IPR	initial precision and recovery
KC	Kansas City
LCS	laboratory control samples
LIMS	laboratory information management system
LPR	Lower Passaic River
LPRSA	Lower Passaic River Study Area
MB	method blank
MDL	method detection limit
mg/L	milligram per liter
MPC	measurement performance criteria
MS	matrix spike
MS/ MSD	matrix spikes /matrix spike duplicate
NA	not available or not applicable
ng/L	nanogram per liter
NJ	New Jersey
NJDEP	New Jersey Department of Environmental Protection
NJDOT	New Jersey Department of Transportation
NOAA	National Oceanic Atmospheric Administration
NY	New York
^{o}C	degrees Celsius
OPR	ongoing precision and recovery
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PAL	project action limit
PCB	polychlorinated biphenyl
PCDD/PCDF	polychlorodibenzodioxin /polychlorodibenzofurans
PE	performance evaluation
pg/g	picogram per gram
PM	project manager

POC	particulate organic carbon
PQLG	project quantitation limit goal
PWCM	Physical Water Column Monitoring
QA	quality assurance
QAC	quality assurance coordinator
QAPP	quality assurance project plan
QC	quality control
QCS	quality control sample
QL	quantitation limit
R	recovery
RA	Removal Action
RI/FS	Remedial Investigation / Feasibility Study
RM	river mile
RPD	relative percent difference
RPM	remedial project manager
RRF	relative response factor
RSCC	Regional Sample Control Coordinator
RSD	relative standard deviation
S&A	sampling and analytical
SM	Standard Method
SOP	standard operating procedure
SOW	scope of work
SSC	suspended solids concentration
TBD	to be determined
TSOP	Technical Standard Operating Procedure
TSS	total suspend solids
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WQMP	water quality monitoring program
WS	worksheet

Dioxin and Furans:

HpCDD	hepta-chlorodibenzo-*p*-dioxin
HpCDF	hepta-chlorodibenzofuran
HxCDD	hexa-chlorodibenzo-*p*-dioxin
HxCDF	hexa-chlorodibenzofuran
OCDD	octa-chlorodibenzo-*p*-dioxin

OCDF	octa-chlorodibenzofuran
PeCDD	penta-chlorodibenzo-*p*-dioxin
PeCDF	penta-chlorodibenzo-furan
TCDD	tetrachloro-dibenzo-*p*-dioxin
TCDF	tetrachloro-dibenzo-furan

Introduction

CDM Federal Programs Corporation (CDM Smith) will accept split samples from the Cooperating Parties Group (CPG) during the water quality monitoring program (WQMP) associated with dredging and capping operations for the River Mile (RM) 10.9 Removal Action (RA).

This Quality Assurance Project Plan (QAPP) Addendum No.13 and the *Lower Passaic River Remedial Investigation / Feasibility Study (RI/FS) Oversight Final QAPP, Physical Water Column Monitoring and Generic Information for Upcoming Tasks*, dated March 2010 (hereafter referred to as the Final QAPP) are the governing documents for execution of this analytical investigation. CDM Smith will use the various plans prepared by the CPG contractors to verify proper execution of the water quality monitoring program sample handling, preservation and shipment.

The CDM Smith Final QAPP indicated that future oversight tasks assigned to CDM Smith would be appended with selected worksheets. The following worksheets are included in this addendum to reflect only the water quality monitoring program for River Mile 10.9 RA analytical procedures and requirements of the CPG's QAPPs written by CH2M Hill, *Quality Assurance Project Plan Remedial Investigation Water Column Monitoring/Small Volume Chemical Data Collection Addendum A Water Quality Monitoring for the River Mile 10.9 Removal Action* dated July 2013:

- Worksheet #1
- Worksheet #2
- Worksheet #3
- Worksheet #10
- Worksheet #11
- Worksheet #12
- Worksheet #14
- Worksheet #15
- Worksheet #16
- Worksheet #18
- Worksheet #19
- Worksheet #20
- Worksheet #28
- Worksheet #29
- Worksheet #30
- Worksheet #36
- Worksheet #37

The CPG's QAPP and Field Sampling Plan provide procedures for the water quality monitoring program for the RM 10.9 RA. Analysis will follow the information provided in CDM Smith's QAPP Addendum 8 Chemical Column Monitoring/Small Volume Chemical Data Collection dated November 2011.

1.1 Summary of Chemical Water Column Monitoring at RM 10.9 Sample Acceptance

CDM Smith's oversight program is designed to provide technical review, verify the accuracy of the CPG's WQMP and evaluate the CPG-implemented QAPPs for sampling and analysis.

The CPG is performing the WQMP study of the Lower Passaic River to provide data needed to characterize chemical concentrations in the water column. This data will support the WQMP as part of the time critical remedial action. The RM 10.9 RA operations (i.e., dredging and capping) may suspend sediments into the water column and may be measureable in the immediate and downstream river environment. The CPG's contractor, CH2M Hill's WQPM is expected to identify exceedance(s) of trigger levels and facilitate response and management of such events, including investigation and mitigation measures. Data are needed to verify the existing turbidity of the total suspended solids (TSS) and the chemicals of potential concern (COPC) correlations and determine any modifications to the current water quality monitoring plan.

CDM Smith will accept split samples from CPG's contractor, CH2M Hill. Split samples will be analyzed as requested by United States Environmental Protection Agency (EPA) and United States Army Corps of Engineers (USACE) as follows:

- Polychlorinated biphenyl (PCB) congeners
- Polychlorodibenzodioxin/furan (PCDD/PCDF) congeners
- Low-Level Mercury (total and dissolved)
- Dissolved organic carbon (DOC)
- Suspended solids concentration (SSC)/ TSS
- Particulate organic carbon (POC)

This oversight QAPP details the planning and execution processes for accepting, preparing and shipping samples for analysis, and evaluation of the data.

QAPP Worksheet #1
Title and Approval Page

Document Title: **LPR Restoration Project Final Quality Assurance Project Plan (QAPP) Addendum No. 13, Chemical Water Column Monitoring for River Mile 10.9**

Lead Organization: United States Army Corps of Engineers (USACE) – Northwestern Division

Preparer's Name and Organizational Affiliation: Vanessa Macwan, CDM Smith

Preparer's Address, Telephone Number, and E-mail Address: 110 Fieldcrest Avenue, #8, 6th Floor, Edison, NJ 08837; (732) 590-4706; MacwanVC@cdmsmith.com

Preparation Date (Day/Month/Year): August 27, 2013

Investigative Organization's Project Manager/Date: _____ Signature

Frank Tsang/CDM Smith

Investigative Organization's Project QA Manager/Date: _____ Signature

Jo Nell Mullins/CDM Smith

Lead Organization's Project Manager/Date: _____ Signature

Elizabeth Franklin/USACE – KC District

EPA Remedial Project Manager /Date: _____ Signature

Stephanie Vaughn

EPA Quality Assurance Officer /Date: _____ Signature

William Sy

Document Control Numbering System: Not Applicable (NA)

QAPP Worksheet #2
QAPP Identifying Information

Site Name/Project Name: Lower Passaic River (LPR) Restoration Project	**Title**: QAPP Addendum No. 13, Chemical Water Column Monitoring Study/Small Volume Data Collection Water Quality Monitoring for River Mile 10.9 Removal Action
Site Location: LPR study area, New Jersey	**Revision Number:** 1
Site Number/Code: NJD 980528996	**Revision Date:** August 7, 2013
Operable Unit (OU): OU2	**Contractor Name:** CDM Federal Programs Corporation (CDM Smith)
Contractor Number: W912DQ-11-D-3004	
Contract Title: Unrestricted Indefinite Delivery/Indefinite Quantity, Multiple Award Contract, for Achitect-Engineer Environmental Services for EPA Region 2 and the Corps of Engineers Northwestern Division.	
Task Order Number: 0005	

1. Regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Superfund)
2. Approval entity: United States Army Corps of Engineers (USACE)
3. The QAPP is (select one): Generic **√ Project Specific**
4. Dates of negotiation: NA
5. Dates and titles of QAPP documents written for previous and current site work, if applicable:

Title	Approval Date
See Final QAPP for a full list of previous QAPP prepared for site work	
Lower Passaic River RI/FS Oversight Final QAPP, Physical Water Column Monitoring and Generic Information for Upcoming Tasks (PWCM/Generic QAPP) (referred to herein as Final QAPP)	March 2010
LPR RI/FS Oversight QAPP, Final Addendum No.1: *Avian Community Survey*	August 6, 2010
LPR RI/FS Oversight QAPP, Final Addendum No.2: *Fish Community Survey*	June 8, 2010
LPR RI/FS Oversight QAPP, Final Addendum No.3: *Benthic Invertebrate Community Survey*	June 8, 2010
LPR RI/FS Oversight QAPP, Addendum No.4: *Surface Sediment Sampling Co-located with the Small Forage Fish Tissue Samples during the Summer 2010 Benthic Community Survey oversight*	July 12, 2010
LPR RI/FS Oversight QAPP, Addendum No.5: *Fish Tissue Analysis*	August 24, 2010
LPR RI/FS Oversight QAPP, Addendum No.6: *Habitat Identification Survey*	August 9, 2010
LPR RI/FS Oversight QAPP, Addendum No.7: *Caged Bivalve Study*	April 29, 2011
LPR RI/FS Oversight QAPP, Addendum No.8: *Small Volume Chemical Water Column Monitoring Study*	August 2, 2011
LPR RI/FS Oversight QAPP, Addendum No.9: *River Mile 10.9 Characterization*	August 25, 2011
LPR RI/FS Oversight QAPP, Addendum No.10: *Low Resolution Coring Supplemental Sampling Program*	January 6, 2012
LPR RI/FS Oversight QAPP, Addendum No.11: *High Volume Chemical Water Column Monitoring Study*	August 28, 2012
LPR RI/FS Oversight QAPP, Addendum No.12: *Collection of Background Surface Sediment Samples During Fall 2012*	November 9, 2012

6. Organizational partners (stakeholders) and connection with lead organization: United States Environmental Protection Agency (EPA), USACE, New Jersey Department of Environmental Protection (NJDEP), New Jersey Department of Transportation (NJDOT), National Oceanic Atmospheric Administration (NOAA), United States Fish and Wildlife Service (USFWS)

7. Data users: EPA, USACE, Partner Agencies, CDM Smith, Louis Berger Group, Inc., HydroQual, Inc., and stakeholders

8. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusions below: the Final QAPP provides all the required worksheet not included herein. *This addendum addresses only the WQPM for the RM 10.9 Removal Action; therefore, only worksheets pertinent to this task and information not previously provided are included.*

This is an oversight project; therefore, the CPG's contractors will be performing health and safety monitoring, and will be responsible for equipment calibration, inspection and maintenance (survey instruments). CDM Smith will monitor the field activities and document observations.

QAPP Worksheet #3
Distribution List

QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address
Stephanie Vaughn	Remedial Project Manager (RPM)	EPA	(212) 637-4427	(212) 637-4393	vaughn.stephanie@epamail.epa.gov
Elizabeth Franklin	Project Manager (PM)	USACE	(816) 389-3581		elizabeth.a.franklin@usace.army.mil
William Sy	Quality Assurance (QA) Officer	EPA	(732) 321-6648	(732) 321-6622	sy.william@epa.gov
Janine MacGregor	Partner Agency	NJDEP	(609) 633-0784		janine.macgregor@dep.state.nj.us
Elkins Green	Partner Agency	NJDOT	(609) 530-8075		elkins.green@dot.state.nj.us
Tim Kubiak	Partner Agency	USFWS	(609) 646-9310		tim_kubiak@fws.gov
Reyhan Mehran	Partner Agency	NOAA	(212) 637-3257		reyhan.mehran@noaa.gov
John Czapor	Program Manager	CDM Smith	(732) 590-4731	(732) 225-7851	CzaporJV@cdmsmith.com
Frank Tsang	Project Manager	CDM Smith	(703) 691-6525	(212) 227-1692	TsangC@cdmsmith.com
Sharon Budney	Deputy Project Manager	CDM Smith	(732) 590-4662	(732) 225-7851	BudneySL@cdmsmith.com
Jeniffer Oxford or other assigned quality assurance coordinator (QAC)	Regional QA Coordinator (QAC) / Project QA Officer	CDM Smith	(212) 377-4536	(212) 227-1692	OxfordJM@cdmsmith.com
Amy Picunas	Field Oversight	CDM Smith	(518) 782-4526	(518) 786-3810	PicunasAE@cdmsmith.com
George Molnar	Field Task Leader	CDM Smith	(732) 590-4633	(732) 225-7851	MolnarGC@cdmsmith.com
Scott Kirchner	Analytical Services Coordinator (ASC)	CDM Smith	(732) 590-4677	(732) 225-7851	KirchnerSF@cdmsmith.com
Candice Navaroli	Laboratory Manager	Axys Analytical Services limited (Ltd.)	(250) 655-5800 or (888) 373-0881	To be determined (TBD)	cnavaroli@axys.com
John Birri	Laboratory Contact	DESA Laboratory	219-769-8378	(732) 906-6886	Birri.John@epamail.epa.gov
Nisreen Saikaly	Laboratory Project Manager	Shealy Laboratory	(800) 673-9375 ext 106	(803) 791-9111	NSaikaly@Shealylab.com
Kevin Falvey	Laboratory Contact	Microbac Laboratories, Inc.	219-769-8378		kevin.falvey@microbac.com

QAPP Worksheet #10
Problem Definition

The problem to be addressed by the project:

The Cooperating Parties Group (CPG) is conducting a study of the Lower Passaic River to provide data needed to characterize chemical concentrations in the water column. This data will support the water quality monitoring program (WQMP) as part of the time critical removal action (RA). CDM Smith will provide oversight and analysis of split samples collected from the LPR Study Area to verify the CPG's compliance with their approved project plans and accuracy of the derived data.

Oversight will include:

- Technical Review and evaluation of CPG's project plans
- Documentation of field activities observations and deficiencies
- Acceptance of split water samples
- Sample handling, packaging and shipping to off-site laboratories
- Review of CPG-selected sampling locations
- Comparison of the data sets to determine any analytical bias

Additional information is provided on Worksheet 11.

The environmental questions being asked:

- Is the CPG contractor complying with the approved plans?
- Does the CPG data adequately describe the site conditions and is it representative for project decisions?
- Are the CPG and CDM Smith data complete and accurate?
- Are the data sets comparable?
- Does the data show any analytical bias?
- Are the relative percent differences (RPDs) between the CPG and CDM Smith data within the measurement performance criteria?

Secondary data: See Worksheet 13 of the CPG QAPP (AECOM 2011)

QAPP Worksheet #10
Problem Definition

The possible classes of contaminants and the affected matrices:

Split surface water samples will be collected for the following chemical analyses:

- Polychlorinated biphenyl (PCB) congeners
- Polychlorodibenzodioxin/furan (PCDD/PCDF)
- Total and dissolved mercury
- Dissolved organic carbon (DOC)
- Suspended solids concentration (SSC)
- Particulate organic carbon (POC)

The rationale for inclusion of chemical and non-chemical analyses:

The split samples will be used to support the goals of the oversight program. The split sample analyses were determined to be more critical for oversight evaluation; the analyses that will not be split are ancillary parameters and not major risk drivers. The field observations and split sample data will enable CDM Smith to perform technical review and evaluation on the CPG field program, analytical data and reports and to assess any potential bias in the CPG dataset.

Project decision conditions ("If..., then..." statements):

- If sample results are not comparable with the CPGs, then CDM Smith will note deviations in the Data Reports submitted to USACE and EPA. The CDM Smith Project Manager, USACE PM and EPA RPM will be informed if there are deviations.
- If the CPG team needs to relocate survey locations, reprioritize analytical parameters, or if there are any changes to the planned analytical program, CDM Smith will communicate this change to the USACE and EPA and document it in the Data Reports.

CDM Smith will present the data findings in a Data Report and submit it to the USACE and EPA who will then determine if any additional actions are required.

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

Who Will Use the Data? USACE, EPA and other partner agencies, CDM Smith, and stakeholders (as necessary).

What Will the Data be Used For?

The RM 10.9 RA operations (i.e., dredging and capping) may suspend sediments into the water column and may be measureable in the immediate and downstream river environment. The CPG contractor's, CH2M Hill, WQMP is expected to identify exceedance(s) of trigger levels and facilitate response and management of such events, including investigation and mitigation measures. Data are needed to verify the existing turbidity - TSS - chemicals of potential concern (COPC) correlations and determine any modifications to the current WQMP.

The CPG will use the study to characterize chemical concentrations in the water column. Oversight activities will monitor the CPG-implemented study, sampling, and analytical program to verify that elements of the approved CPG QAPPs are fulfilled. The CDM Smith field crew will also review the CPG-selected sampling locations and procedures. CDM Smith's split sample results will be compared to the data obtained by the CPG to determine if a bias exists in the data produced by the CPG and if the data are complete, accurate and compliant with the approved QAPPs.

A comparison of the split sample data and the CPG parent sample data will only be completed for parameters that were analyzed and detected by both the CPG program and the oversight program. Data comparison will not be conducted on concentrations that are non-detect. (Note that if a consistent bias in detections is observed in either the split samples or CPG samples, an evaluation of detection limits will be completed.) The data comparison will be presented in a table showing the relative percent difference for values that are 5 times the quantitation limits. As appropriate, alternative data comparisons will be provided. For each location, a mean and variance of the sample concentrations may also be calculated. These statistics will be compared to the CPG samples. For analytical groups that contain multiple parameters (e.g., congeners), the data comparison will be completed on select parameters per chemical class. Parameters will be selected by the project chemist/and analytical service coordinator to cover a range of concentrations from non-detects to high concentrations. In addition analytes of greater risk or of greater concern will be selected for comparison over other analytes. This selection will be made with the consensus of the USACE and EPA.

CDM Smith's quality control (QC) data will be used to determine CDM Smith's split sample data quality and comparability with the CPG's data and whether sample results are acceptable based on the established project data quality objectives (DQOs). QC sample results will be compared to the measurement performance criteria (MPC) of the data quality indicators (DQIs).

To further achieve these objectives, CDM Smith field personnel will observe and monitor the CPG contractor's implementation of the CPG QAPPs and will note any deviations. Deviations will be brought to the attention of the CPG's contractor, and reported to the CDM Smith project manager who will communicate this information to the USACE PM and EPA RPM. These will be documented in ongoing and Final Reports and include a discussion of the impact of the deviation(s) on the data quality. The CPG contractor's activities will be documented in the field logbook.

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

What Type of Data is Needed?
Split water column samples will be collected at locations and depths selected by mutual agreement between CDM Smith and the CPG contractor or as directed by the CDM Smith Deputy PM or the USACE/EPA project managers.

Chemical data will be obtained from the split samples accepted from the CPG. Low limits are required for mercury as shown on QAPP worksheet #15 of Addendum 8.

How much data are needed?

CDM Smith will accept split samples at approximately 5 percent of the sampling locations. Worksheets #11, 18 and Figure 1 of the CPG's QAPP and show the planned locations for sampling.

Approximately 5 percent of the samples will be split to determine if a bias exists in the data produced by the CPG. Field rinsate blanks and one field duplicate will also be sent for analysis. Oversight activities are listed in Worksheet 10.

How "good" do the data need to be in order to support the environmental decision?

Definitive level data are required to produce the data quality required for full validation of the data and to enable comparison with the CPG generated data set. Fixed based laboratories with EPA, Environmental Laboratory Accreditation Program or National Environmental Laboratory Accreditation Program certifications and qualification will be used to generate the analytical data. CDM Smith has attempted to use comparable methods and obtain similar reporting limits to the CPG's. CDM Smith's oversight staff will document whether the WQPM is in compliance with the CPG's QAPP.

The representativeness of the data is dependent on the sampling design established by the CPG. Split samples will be obtained by the alternate filling of the sample bottles with the CPG's contractor with a sufficient volume to fulfill analytical needs.

The laboratory reporting limits (contract required quantitation limits (CRQLs)) for the EPA Division of Environmental Science and Assessment (DESA) data, or reporting limits for subcontract laboratory data), need to be below or equal to the CPG's project required quantitation limits goals or the CPG's achievable laboratory quantitation limits.

Validation of data will be performed by DESA/ EPA; however, samples analyzed by a subcontract laboratory will be validated by CDM Smith.

In addition, to ensure that measurement performance criteria for usability (criteria for DQIs) are met, all CDM Smith data will be subject to a data usability assessment. The inputs will be the EPA generated validation reports and CDM Smith's data validation summary reports. Measurement performance criteria presented in Worksheets No.12, 28, and 36 will be evaluated as discussed on Worksheet No.37. The results will be presented in a CDM Smith data report.

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

The data usability assessment will evaluate whether appropriate field procedures were followed and whether data met the approved QAPP and project DQOs, and are usable for the stated project needs.

Where, when, and how should the data be collected?

When – Split surface water samples will be accepted from the CPG. The CPG will collect the samples between summer 2013 and fall 2013. This WQMP will be performed according to the CPG's schedule; the exact sampling dates are to be determined.

Where – The surface water will be collected from the LPRSA locations shown on CH2M Hill's Figure 1. CPG's QAPP worksheet 11 describes which locations will be sampled. Samples will be submitted for rapid analytical turnaround for all parameters. CDM Smith will accept split samples from Buoy #2 200 feet from the removal area perimeter. All split locations will be determined by the CDM Smith field oversight personnel in consultation with the CDM Smith deputy project manager and EPA.

How – Sampling procedures are described in the CPG's QAPP (CH2M Hill) (various worksheets). Split samples will be facilitated by CPG contractor by filling up one bottle for a particular analysis, followed by CDM Smith oversight personnel filling up a bottle for the same analysis immediately after. This method will be followed until all bottles are filled.

The CPG key sampling tasks are:

- Initial Dredging Monitoring (first 48 hours, July 2013): The turbidity–TSS correlation obtained from the baseline monitoring will be the starting point for the WQMP. This correlation will be updated as required during the initial dredging operations. During the first 48 hours of dredging, one composite sample (comprising individual samples collected every 2 hours) will be collected daily at each of the four fixed buoys for analysis of select COPCs (PCDDs/PCDFs, PCB congeners, and mercury), POC, DOC, and TSS.

  During this initial phase of monitoring, a small vessel will monitor for the presence of any visible turbidity plumes downstream of dredging activities using the same type of turbidity monitor used at the four fixed buoy locations. If a plume is observed, TSS samples will be collected from mid-depth. Sampling will start at the dredge and continue at fixed intervals in the direction of current flow within the center of the visible suspended solid plume until the downstream point is reached where turbidity levels return to approximately ambient levels. Surface water TSS sample/turbidity monitoring locations will be surveyed via global positioning system (GPS) and recorded.

- Re-suspension Monitoring: Once established, the correlation curve will be used to estimate the TSS concentration from the measured turbidity value, and turbidity will be measured continually during dredging operations at the five monitoring locations. Weekly synoptic (within same tidal cycle) transect sampling will also be conducted at each of the for fixed buoy locations (surface and mid-depth) for analysis of TSS, POC, and DOC in addition to a weekly composite sample to characterize select COPCs (PCDDs/PCDFs, PCB congeners, and mercury), POC, DOC, and TSS.

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

If a turbidity plume is observed, TSS samples will be collected as discussed in the Initial Dredging Monitoring task.

- Event-Based COPC Monitoring (exceedance of Turbidity Action Level): The purpose of this sampling is to collect surface waters if the Turbidity Action Level is exceeded. Sampling locations will be determined real-time based on the turbidity distribution pattern among the four fixed buoy locations. Samples will be analyzed for select COPCs (PCDDs/PCDFs, PCB congeners, and mercury), POC, DOC, and TSS.

Who will collect and generate the data?

CDM Smith oversight staff will record field observations in logbooks. The CPG's contractor will provide a split a portion of the water samples to CDM Smith who will label, pack and ship to the appropriate laboratory. Spilt samples will be collected by switching bottles. The CPG contractor will fill up one bottle for a particular analysis, followed by CDM Smith oversight personnel filling up a bottle for the same analysis immediately after. This method will be followed until all bottles are filled. The analytical laboratories outlined in this QAPP Addendum will generate the data.

Summary of Changes to the Field Program

CDM Smith's oversight staff will accept one split of first 48 hours and six to 12 from the re-suspension monitoring. The samples will be analyzed for PCB congeners and homologs, PCDD/PCDF congeners, low level mercury (total and dissolved), DOC, POC and SSC. The split sediment samples to be accepted and analyses to be performed are detailed on Worksheet #20.

CDM Smith will oversee the CPG monitoring activities include the following:

- Monitor the water quality outside the silt curtains surrounding the dredge areas for increased re-suspension during dredging operations
- Quantify select COPC concentrations in the water column during dredging operations
- Adjust operations as needed to achieve desired water quality during dredging

QAPP Worksheet #11
Project Quality Objectives /Systematic Planning Process Statements

How will the data be reported?

- Accepted split samples will be recorded as described in CDM Smith's Final QAPP using field logbooks in accordance with technical standard operating procedure (TSOP) 4-1 provided in Appendix C of the Final QAPP.
- Results will be reported in text and table format and will include a discussion of the data quality, deviations from the QAPP, and oversight data comparability with the CPGs data. This review will be used to evaluate the accuracy of the CPG data.
- Sample results generated by the DESA laboratory will be e-mailed to CDM Smith for use in the data assessment and evaluation
- Sample results generated by CDM Smith's subcontract laboratory will be e-mailed to CDM Smith for review and validation.
- Data reporting is further covered in the Final QAPP.

How will the data be archived?

- The Final QAPP contains other archival information.

QAPP Worksheet #12-a
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	PCB Congeners
Concentration Level	Low

Sampling Procedure	**Analytical Method/ SOP**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria[1] (MPC)**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)**
CPG Group's SOP, and QAPP CDM Smith will accept splits	EPA Method 1668A AXYS Laboratory MLA-010 Revision 10	Precision	RPD ≤ 40% if concentration ≥5 CRQL	Split samples and field duplicates	S & A
		Precision	±20% of mean if concentration >10DL[2]	Laboratory duplicate	A
		Accuracy/Bias	Supplier Certified Limits Per laboratory or method SOP (70-130% of native analytes and 50-150% for surrogates)	CRM Calibration Verification Sample	A
		Accuracy/Bias Precision	60-140 %recovery RSD ≤ 40%	Initial Precision and Recovery	A
		Accuracy/Bias	Per laboratory SOP Warning 70-130%R; Accept 50-150 %recovery	LCS or OPR	A
		Accuracy/ Representativeness	0-6 degrees Celsius 10 degrees Celsius (DV)	Temperature Blank checks DV	S
		Comparability	Comparable units, and methods	Assessed during DQA	S & A
		Completeness	≥ 90% collection and analysis	Assessed during DQA	S & A
		Sensitivity/ accuracy	≤ QLs (WS#15 and laboratory SOP)	Field rinsate/ Method blanks assessed during DV and DQA	S & A

Notes:

1. The assigned laboratory must perform and meet all the quality assurance requirements specified in the method.
2. The DLs referenced in the laboratory SOP are equivalent to the QLs or sample reporting limits.

QAPP Worksheet #12-b
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	PCDD/PCDF
Concentration Level	Low

Sampling Procedure	**Analytical Method/ SOP**	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria (MPC)[1]**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)**
CPG Group's SOP, and QAPP CDM Smith will accept split	USEPA Method 1613B – Axys Analytical Services SOP MLA-017 rev 20 Method is proprietary; a summary is provided in Appendix M in QAPP Addendum 8	Precision	RPD ≤ 40% if concentration ≥5 QL	Split samples and field duplicates	S & A
		Precision	±20% of mean if concentration >10DL[2]	Laboratory duplicate	A
		Accuracy/Bias Precision	70-130 %recovery (or per laboratory SOP) RPD ≤ 40%	MS/MSD	S & A
		Accuracy/ Representativeness	0-6 degrees Celsius 10 degrees Celsius (DV)	Temperature Blank checks DV	S
		Precision	Per laboratory SOP	Initial precision and recovery standard	A
		Accuracy/Bias	Various % recovery per laboratory SOP		
		Accuracy/Bias	70-130 %recovery	OPR	A
		Accuracy/Bias	17-130% recovery	Surrogate standards	A
		Comparability	Comparable units, and methods	Evaluated during DQA	S & A
		Completeness	≥ 90% collection and analysis	Evaluated during DQA	S & A
		Sensitivity/ accuracy	≤ QLs (WS#15 and laboratory SOP)	Field rinsate/ Method blanks assessed during DV and DQA	S & A

Notes:
1. The assigned laboratory must perform and meet all the quality assurance requirements specified in the method.
2. The DLs referenced in the laboratory SOP are equivalent to the QLs or sample reporting limits.

QAPP Worksheet #12-c
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	Total and Dissolved Mercury
Concentration Level	Trace (nanogram per liter (ng/L))

Sampling Procedure	Analytical Method/ SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria (MPC)[1]	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
CPG Group's SOP, and QAPP CDM Smith will accept split	EPA Method – 1631 Microbac SOP Hg-1631, Revision 2	Precision	RPD ≤ 40% if concentration ≥5 CRQL	Split samples and field duplicates	S & A
		Accuracy	RPD ≤ 25% for values ≥10 method detection limit (MDL). No more than 35% of RSDs >25%	Laboratory duplicate	A
		Accuracy/Bias	70-130 %recovery	MS/MSD	A
		Precision	Laboratory SOP or RPD ≤ 30-35%; RSDs <20%	MS/MSD; Initial Precision and Recovery	A
		Accuracy	Laboratory SOP or 70-130%R; 75-125%R	OPR; Standard Reference Material	A
		Accuracy/ Representativeness	0-6 degrees Celsius 10 degrees Celsius (DV)	Temperature Blank checks DV	S & A
		Comparability	Comparable units, and methods	Evaluated during DQA	S & A
		Completeness	≥ 90% Collection and ≥ 90% Valid data	Evaluated during DQA	S & A
		Sensitivity/ accuracy	≤ QLs (WS#15 and laboratory SOP) ≤ 5MDLs	Field rinsate/ Method blanks assessed during DV and DQA	S & A

Notes:
The assigned laboratory must perform and meet all the quality assurance requirements specified in their method SOP.

QAPP Worksheet #12-d
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	Dissolved Organic Carbon (DOC)
Concentration Level	Low

Sampling Procedure	Analytical Method/ SOP[1]	Data Quality Indicators (DQIs)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
CPG Group's SOP, and QAPP	Laboratory Filtration + SM 5310B (DESA SOP C-83 Modified)	Precision	RPD ≤ 40% if values >5x QL; otherwise ABS < 5xQL	Field duplicates and Split samples	S & A
		Accuracy	80-120%R	Matrix Spike	A
		Accuracy/Bias	80-120%R or as updated by laboratory or stipulated by manufacturer	Quality Control Sample (QCS); Laboratory Fortified Blank /DV	A
		Precision	RPD ≤ 20% if values >5x QL; otherwise ABS < 5xQL	Laboratory replicate	
		Accuracy	85-115%R	Initial calibration verification (ICV)/ continue calibration verification (CCV)	A
		Accuracy/ Representativeness	0-6 degrees Celsius 10 degrees Celsius for DV[3]	Temperature Blank checks Data validation /DV	S & A
		Comparability	Comparable units, QLs and methods	Data Quality assessment	S & A
		Completeness	≥ 90%	Data Quality Assessment	S & A
		Sensitivity/ accuracy	≤ QLs[4]	Method blanks/Calibration Blank	A
		Sensitivity	Detection limits meet project goals	Data Quality Assessment	A

Notes:

1. The laboratory must perform and meet all the quality assurance requirements specified in the laboratory method SOP.
2. QAPP Worksheet # 23 provides more information on the sampling and analytical SOPs.
3. QAPP worksheet #36 describes the data validation procedures to be used. The data validator will check to verify if the MPC are met.
4. See worksheet #15 in QAPP Addendum 8 for the QL requirements.

QAPP Worksheet #12-e
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	Particulate Organic Carbon (POC)
Concentration Level	Low

Sampling Procedure	Analytical Method/ SOP[1]	Data Quality Indicators (DQIs)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
CPG Group's SOP, and QAPP	Laboratory Filtration + EPA 415.1 (DESA SOP C-88 Modified)	Precision	RPD ≤ 40% if values >5xQL; otherwise ABS ≤ QL	Field duplicates	S & A
		Precision	See worksheet #11	Split samples	S & A
		Accuracy/Bias	80-120%R or as stipulated by manufacturer or laboratory	Quality Control Sample (QCS) or Laboratory Fortified Blank or Standard Reference Material	A
		Precision	≤20 % RPD		
		Precision	≤20 % RPD if values >5xQL; otherwise ABS ≤ QL	Laboratory matrix duplicate/ DV[3]	A
		Accuracy	85-115%R	ICV/CCV	A
		Accuracy/ Representativeness	0-6 degrees Celsius 10 degrees Celsius for DV [2]	Temperature Blank checks Data validation /DV	S
		Comparability	Comparable units, QLs and methods	Data Quality assessment	S & A
		Completeness	≥ 90%	Data Quality Assessment	S & A
		Sensitivity/ Accuracy	≤ QLs[4]	Method blanks/Calibration Blank	A
			Detection limits meet project goals	Data Quality Assessment	A

Notes:

1. The laboratory must perform and meet all the quality assurance requirements specified in the laboratory method SOP.
2. QAPP Worksheet # 23 provides more information on the sampling and analytical SOPs. Method 415.1 is equivalent to EPA 440.0.
3. QAPP worksheet #36 describes the data validation procedures to be used. The data validator will check to verify if the MPC are met.
4. See worksheet #15 in QAPP Addendum 8 for the QL requirements.

QAPP Worksheet #12-f
Measurement Performance Criteria Table

Matrix	Aqueous
Analytical Group	Suspended Solids Concentration (SSC)
Concentration Level	Low

Sampling Procedure	Analytical Method/ SOP[1]	Data Quality Indicators (DQIs)	Measurement Performance Criteria (MPC) [4]	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
CPG Group's SOP, and QAPP	SM 2540D/E (DESA C-33 Modified) [2]	Precision	RPD ≤ 40% if values >5xQL; otherwise ABS ≤ QL	Field duplicates	S & A
		Precision	See worksheet #11	Split samples	S & A
		Accuracy/Bias	80-120%R or as stipulated by manufacturer or laboratory	Quality Control Sample (QCS) or Laboratory Fortified Blank	A
		Accuracy/ Representativeness	0-6 degrees Celsius 10 degrees Celsius for DV [3]	Temperature Blank checks Data validation (DV)	S
		Precision	≤20 % RPD if values >5xQL; otherwise ABS ≤ QL	Laboratory matrix duplicate/ DV[3]	A
		Comparability	Comparable units, QLs and methods	Data Quality assessment	S & A
		Completeness	≥ 90%	Data Quality Assessment	S & A
		Sensitivity/ Accuracy	≤ QLs[3]	Method blanks	A
		Sensitivity	Detection limits meet project goals	Data Review	A

Notes:

1. The laboratory must perform and meet all the quality assurance requirements specified in the laboratory method SOP.
2. Method SM 2540D is equivalent to ASTM 3977-97 Test Option B.
3. QAPP worksheet #36 describes the data validation procedures to be used. The data validator will check to verify if the MPC are met.
4. See worksheet #15 in QAPP Addendum 8 for the QL requirements.

QAPP Worksheet #14
Summary of Project Tasks

Sampling Tasks:
CDM Smith will accept split samples from the CPG's sampling contractor during each WQMP sampling event for the RM 10.9 RA. CDM Smith's oversight staff will package, label and ship samples and QC samples to the DESA laboratory and the subcontract laboratories outlined on QAPP Worksheet 30.

Analysis Tasks:
Split samples will be collected from the CPG.

Analyses of surface water samples will include PCB congeners, PCDD/PCDF, mercury (total and dissolved), DOC, POC, and SSC.

Quality Control Tasks: CDM Smith will observe CPG's sampling of the surface water samples. CDM Smith will accept splits and one field rinsate blank of the equipment used to collect the samples. The CDM Smith Deputy Project Manager or designee will review the logs to ensure that the required information has been documented.

Secondary Data: Since this is an oversight project, no secondary data are being used directly by CDM Smith. Data generated by the CPG - field program will be used as shown on worksheet 11 of the CPG's QAPP.

Data Management Tasks: Analytical data generated by the various laboratories will be managed according to the procedures described in the Final QAPP.

Documentation and Records: Records of accepted surface water samples will be documented in accordance with TSOP 4-1 provided in Appendix C of the Final QAPP. The Surface water analysis results will be documented in the following:

1. Data Validation reports
2. Chain of custody (COCs), Analytical Servcices Tracking System (ANSETS), and Trip Report
3. Oversight summary report
4. Data Quality and Usability Summary Report

Assessment/Audit Tasks: See Final QAPP for assessment tasks (CDM Smith 2009)

Data Review Tasks: The CPG's Data Summary Report will be reviewed by CDM Smith. A data quality evaluation will be performed based on the CPG's compliance with their approved QAPP. A comparison of CDM Smith's and the CPG's surface water sample results will be included in the data quality evaluation and submitted to the USACE.

QAPP Worksheet #15
Reference Limits and Evaluation Table

The following worksheets have been added to this QAPP Addendum:
Worksheet #15 – Dioxin/Furan

See the QAPP Addendum 8 for Reference Limits and Evaluations Table for the following aqueous analyses:
Worksheet #15 – PCB Congeners, total and dissolved mercury, DOC, POC, and SSC

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Aqueous
Analytical Group: PCDD/PCDF by EPA 1613B
Concentration Level: Low

Analyte	CAS Number	Project Action Limit (µg/L) [1]	Project Quantitation Limit Goals (pg/L) [2]	EPA 1613B Analytical Method [3]		Method 1613B Achievable Laboratory Limits	
				MDLs (µg/L) [3]	Method CRQLs [3]	MDLs (µg/L) [4]	QLs (µg/L) [4]
2378-TCDD	1746-01-6	5.00E-09	5	NA	1.0E-05	4.4E0-7	0.5E-06
12378-PeCDD	40321-76-4	5.00E-09	25	NA	5.0E-05	1.6E-06	1.0E-06
123678-HxCDD	57653-85-7	5.00E-08	25	NA	5.0E-05	1.8E-06	1.0E-06
123478-HxCDD	39227-28-6	5.00E-08	25	NA	5.0E-05	1.3E-06	1.0E-06
123789-HxCDD	19408-74-3	5.00E-08	25	NA	5.0E-05	1.2E-06	1.0E-06
1234678-HpCDD	35822-46-9	5.00E-07	25	NA	5.0E-05	1.4E-06	1.0E-06
OCDD	3268-87-9	1.70E-05	50	NA	1.0E-06	4.1E-06	5.0E-06
2378-TCDF	51207-31-9	5.00E-08	5	NA	1.0E-05	4.5E-07	0.5E-06
12378-PeCDF	57117-41-6	1.70E-07	25	NA	5.0E-05	2.0E-06	1.0E-06
23478-PeCDF	57117-31-4	1.70E-08	25	NA	5.0E-05	1.8E-06	1.0E-06
123678-HxCDF	57117-44-9	5.00E-08	25	NA	5.0E-05	8.2E-07	1.0E-06
123789-HxCDF	72918-21-9	5.00E-08	25	NA	5.0E-05	2.2E-06	1.0E-06
123478-HxCDF	70648-26-9	5.00E-08	25	NA	5.0E-05	9.2E-07	1.0E-06
234678-HxCDF	60851-34-5	5.00E-08	25	NA	5.0E-05	1.4E-06	1.0E-06
1234678-HpCDF	67562-39-4	5.00E-07	25	NA	5.0E-05	1.2E-06	1.0E-06
1234789-HpCDF	55673-89-7	5.00E-07	25	NA	5.0E-05	9.7E-07	1.0E-06
OCDF	39001-02-0	1.70E-05	50	NA	1.0E-06	2.8E-06	5.0E-06
Total HpCDF	38998-75-3	NA	50	NA	NA	NA	NA
Total HpCDD	37871-00-4	NA	50	NA	NA	NA	NA
Total HxCDF	55684-94-1	NA	50	NA	NA	NA	NA
Total HxCDD	34465-46-8	NA	50	NA	NA	NA	NA
Total PeCDF	30402-15-4	NA	50	NA	NA	NA	NA
Total PeCDD	36088-22-9	NA	50	NA	NA	NA	NA
Total TCDF	55722-27-5	NA	50	NA	NA	NA	NA
Total TCDD	41903-57-5	NA	50	NA	NA	NA	NA

QAPP Worksheet #15
Reference Limits and Evaluation Table

Notes:

1. Project-specific action levels are based on the CPGs listed action levels (PALs).
2. The project quantitation limit goals (PQLGs) are the Achievable Laboratory QLs for individual PCDDs/PCDFs based on the CPG goals which are derived from the lower of *Quality Assurance Project Plan Remedial Investigation Water Column Monitoring/Small Volume Chemical Data Collection Addendum A Water Quality Monitoring for the River Mile 10.9 Removal Action (July 2013)*. The split sample data limit should be low enough for data comparison. Differences in laboratory detection limits will be considered when comparing the data.
3. Specific MDLs are not given in USEPA Method 1613B, but the QLs listed are the minimum levels published in Table 2 of USEPA Method 1613B. The actual detection limits are usually dependent on the level of interference rather than instrument limitations.
4. The MDLs listed are the statistically-derived MDLs. The QLs listed are obtained from Axys Analytical Services. Actual QLs may be higher and are dependent on the sample matrix effects.

QAPP Worksheet #16
Project Schedule Timeline Table

Activities	Organization	Anticipated Date(s) of Initiation	Anticipated Date of Completion	Deliverable	Deliverable Due Date
Prepare and submit: Oversight QAPP Addendum for WQMP to EPA and USACE	CDM Smith	July 30, 2013	August 7, 2013	UFP-QAPP addendum, Draft	August 7, 2013
Acceptance of splits and sample handling activities	CDM Smith	Summer 2013 – Fall 2013	Approximately 8 weeks after commencement date	Summary report of chemical data	To be determined
Laboratory Analysis	CDM Smith subcontract laboratory(ies)	Summer 2013 – Fall 2013	Fall 2013 (Exact date to be determined; data collection will be dependent on the CPG schedule)	Data Package	To be determined; will be dependent on the CPG schedule For standard analyses, 21 days after the last sample is received; however, specialized analyses may take additional time
Validation and verification of sample data	CDM Smith	Summer 2013 – Fall 2013	Fall 2013	Validated data report	To be determined; will be dependent on CPG schedule
Oversight /Data Evaluation	CDM Smith	To be determined	To be determined	Oversight data Comparison and Summary Report/ Data Quality Summary Report	To be determined
Review Chemical Water Column Study RM 10.9 Analysis Data Report	CDM Smith	90 days after each sampling event	1 month after receipt of report	Comments on Chemical Water Column Study Analysis Data Report	1 month after receipt of report

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Survey Location ID	Media	Analytical Group	Concentration Level	Estimated Number of Samples (identify field duplicates)	Sampling SOP Reference	Rationale for Sampling Location
Refer to QAPP prepared by CH2M Hill for the CPG and Figure 1 (Lower Passaic Locations only)	Aqueous samples	PCB congeners, PCDD/PCDF congeners, mercury (total and dissolved), DOC, POC and SSC	Low	Approximately 5 percent of CPG samples will be split.	CH2M Hill's QAPP SOPs (July 2013)	Split samples will be accepted judgmentally by the on-site oversight staff in consultation with the PM and USACE/EPA
See Worksheet #20 for number of split samples. See CPG's QAPP Worksheet No.18 for the sampling locations and sampling rationale.						

Notes:
Refer to the QAPP prepared by CH2M Hill for the CPG (Worksheets #10, 11 and 18 and Figure 1) titled*, Quality Assurance Project Plan Remedial Investigation Water Column Monitoring/Small Volume Chemical Data Collection Addendum A Water Quality Monitoring for the River Mile 10.9 Removal Action (July 2013)* for sampling information. Spilt samples will be collected by switching bottles. The CPG contractor will fill up one bottle for a particular analysis, followed by CDM Smith oversight personnel filling up a bottle for the same analysis immediately after. This method will be followed until all bottles are filled.

Lower Passaic locations vary depending on the event as described in the CPG's QAPP Addendum. They include RM 10.2 approximately 200 feet upstream of the RM 10.9 RA's southern perimeter boundary, approximately 200 feet upstream of the RM 10.9 RA's northern perimeter boundary, and RM 11.7.

QAPP Worksheet #19 – Surface Water Analysis
Analytical SOP Requirements Table

Matrix[1]	Analytical Group	Concent-ration Level	Analytical and Preparation Method/SOP Reference[2]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light)[3]	Maximum Holding Time (preparation/ analysis)
AXYS Laboratory							
Aqueous	PCB Congeners	Low	USEPA 1668A (Axys SOP MLA-010)	1 Liter (L)	1L amber glass	Fill bottle to top (no headspace); 0-6°C; store in the dark	1 year for preparation and analysis
Aqueous	PCDD/PCDF	Low	EPA 1613B (Axys SOP MLA-017)	1L	1L amber glass	Fill bottle to top (no headspace); 0-6°C; store in the dark	1 year for preparation and analysis
Microbac Laboratory							
Aqueous	Mercury (Hg) total and dissolved	Low	Microbac SOP Hg-1631 Rev. 2	500 mililiter (mL) each	2x500 mL glass bottle (1 for total, 1 for dissolved)	Fill bottle to top (no headspace); 0-6°C; Preserve with HNO3	Preservation within 28 days; 90 days from collection to analysis
DESA							
Aqueous	DOC	Low	DOC: SM5310B (DESA SOP C-88 Modified)	600 mL	(3) 200 mL amber glass bottle or protect from light	Cool to 0-6°C; No headspace Lab will filter, H_2SO_4 to pH <2;	Ship to the laboratory for preservation and filtering within 48 hours. Filters and filtrates must be analyzed within 28 days.
Aqueous	POC	Low	POC: USEPA 415.1 (DESA SOP C-83 Modified)				
Aqueous	SSC	Low	SM2540D (DESA SOP C-33 Modified)	1000 mL	(1) 1 L HDPE or amber glass bottle or protect from light	Cool to 0-6°C; No headspace	28 days to analysis

Notes:

1. Preservative to be added at laboratory if unable to take pre-preserved bottles on boat during sampling. CDM Smith will determine with the laboratories which samples will be preserved at the laboratories.
2. The CDM Smith analytical subcontract laboratory SOPs for these analyses are shown in Appendix M of QAPP Addendum 8. Method modifications are outlined in the laboratory SOPs.

   The Axys laboratory SOPs are proprietary but SOP summaries are included in CDM Smith QAPP Addendum #8.
3. The actual jar size may vary depending on the need of the assigned laboratory. The sampler should confirm sample volumes with the laboratory prior to mobilizing to the field. Samples may be shipped to the laboratories unpreserved for preservation by the laboratory.

QAPP Worksheet #20
Field Quality Control Sample Summary Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference	No. of Split Sampling Locations[2]	No. of Field Duplicate Pairs[5]	No. of Extra Volume Laboratory QC (e.g., MS/MSD or Duplicate) Samples	No. of Equipment Rinsate Blanks[3]	No. of Trip. Blanks	No of PE Samples	Total No. of Samples
Aqueous	PCB congeners	Low	USEPA 1668A (Axys SOP MLA-010)	7	1	1 per first 48 hour and 6 per re-suspension monitoring sampling event	(Ambient blank) 1	0	0	9
Aqueous	PCDD/PCDF	Low	EPA 1613B (Axys SOP MLA-017)	7	1	1 per first 48 hour and 6 per re-suspension monitoring sampling event	1	0	0	9
Aqueous	DOC	Low	DOC: SM5310B (DESA SOP C-88 Modified)	7	1	1 per first 48 hour and 6 per re-suspension monitoring sampling event	0	0	0	8
Aqueous	POC	Low	POC: USEPA 415.1+ (DESA SOP C-83 Modified)	7	1	1 per first 48 hour and 6 per re-suspension monitoring sampling event	0	0	0	8
Aqueous	SSC	Low	SM2540D (DESA SOP C-33 Modified)	7	1	6 per re-suspension monitoring sampling event	0	0	0	8
Aqueous	Total and Dissolved Mercury	Low	Microbac SOP for EPA Method 1631	7	1	6 per re-suspension monitoring sampling event	1	0	0	9

Notes:

1. The Field and Analytical Services Teaming Advisory Committee (FASTAC) decision process is required for obtaining laboratory services. However for this project it is critical for CDM Smith to mirror the CPG's analytical procedures in addition to maintaining similar volumes to provide comparable data and detection limits. This limits the number of laboratories and the methods which can be used. Low concentrations and flexibility are required for the Passaic project. Also due to the difficulty of analyzing the sample matrix for the selected analyses subcontract laboratories are being used to supplement DESA services to ensure accurate results, to reduce uncertainties in the measurements and to obtain data comparable with data from previous and future surveys and with the CPG's data. PCB congeners and dioxin/furans will be analyzed by Axys laboratory. CDM Smith subcontracted one of its master services agreement laboratories, Shealy, to obtain analytical services for the mercury which will be analyzed by Microbac laboratory.
2. Refer to Worksheet #11 for the field sampling event in which sample parameters will be split.
3. Rinsate blanks will be prepared near the beginning and near the end of all the WQMP sampling events.
4. CPG mentions expedited analysis but they do not provide details. CDM Smith recommends expedited preliminary results be received from the laboratory (within a week of sample collection if possible).
5. For weekly sampling since the split will be one sample a week CDM Smith recommends that we collect only one duplicate sample for the program.

QAPP Worksheet #28-a
QC Samples Table

Matrix	Aqueous
Analytical Group /Concentration Level	PCB Congeners/ Low (pg/L)
Sampling SOP(s)	See Worksheet #21 – split of CPG samples
Analytical Method/SOP Reference	EPA 1668A (MLA-010 Full SOP)
Sampler's Name	TBD
Field Sampling Organization	CDM Smith
Analytical Organization	Axys Analytical Services Ltd.
No. of Sample Locations	See Worksheets #18 & 20

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per 20 samples	Concentration < 2 picogram (pg), 10 pg or 50 pg/sample-See SOP Table 1. Sum of all congeners < 300 pg /sample unless sample concentrations > 10* blank levels	If samples non-detect or if lowest sample result is >10 times the blank-no action; otherwise redigest and reanalyze	Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Analysis (Laboratory) Duplicate	1 per 20 samples	± 20%mean for concentrations >10*QL	Flag outliers	Laboratory Analyst	Precision	RPD ≤ 40% for concentrations >10x DL[1]; otherwise ABS<QL
Certified Reference Material or Quality Control Sample	Periodically at least quarterly	50-150%R;	Check standards; recalibrate if required	Laboratory Analyst	Accuracy	70-130%R;
Calibration Verification Sample	Beginning of each 12-hour shift	70-130%R;	Adjust and/or recalibrate	Laboratory Analyst	Accuracy/bias	70-130%R
Initial Precision and Recovery	Prior to sample analysis	Per laboratory SOP	Investigate and correct	Laboratory Analyst	Accuracy	60-140%R ≤ 40% RSD
Ongoing Precision and Recovery	1 per batch of 20 samples	Per laboratory SOP	Identify source of problem, recalibrate if needed/ make other adjustments and reanalyze	Laboratory Analyst	Accuracy	Warning 70-130%R; Accept 50-150%R
Sample splits and field duplicates	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; address in data quality assessment	CDM Smith ASC	Precision	RPD ≤ 40%; ABS<QL for samples <5x QL
Temperature Blank	**1 per cooler**	**0-6 degrees Celsius**	**Note outlier in laboratory narrative. Inform CDM Smith of failure and need for additional coolant; check packing procedure**	**Laboratory Analyst**	**Accuracy/ representativeness**	**≤ 10 degrees Celsius for data validation**

Notes: 1. The DLs referenced in the laboratory SOP are equivalent to the QLs or sample reporting limits.

QAPP Worksheet #28-b
QC Samples Table

Matrix	Aqueous
Analytical Group	PCDD/PCDF
Concentration Level	Low (µg/L)
Sampling SOP(s)	See Worksheet #21 – split of CPG samples
Analytical Method/SOP Reference	EPA 1613B/ MLA-017 (MSU-017, Rev 4, March 2011)
Sampler's Name	TBD
Field Sampling Organization	CDM Smith
Analytical Organization	Axys Analytical Services Ltd.
No. of Sample Locations	See Worksheet #18 & 20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per 20 samples	TCDD/F <0.5 pg/sample, PeCDD/F, HxCDD/F, HpCDD/F <1.0 pg/sample, OCDD/F <5 pg/sample unless sample concentrations > 10* blank levels (per SOP)	If samples non-detect or if lowest sample result is >10 times the blank-no action; otherwise redigest and reanalyze	Laboratory Analyst	Accuracy/Sensitivity	No analyte > QL
Laboratory Duplicate	1 per 20 samples	± 20% mean for concentrations >10*QL	Investigate and correct; Flag outliers	Laboratory Analyst	Precision	± 20% of mean if sample concentration >10x DL[2]
Initial Precision and Recovery	Prior to sample analysis	Per laboratory SOP, Table 1	Investigate and correct	Laboratory Analyst	Accuracy	Per method/laboratory SOP
Ongoing Precision and Recovery	1 per batch of 20 samples	Per laboratory SOP, Table 1 (70-130%R)	Identify source of problem, make other adjustments; redigest if needed and reanalyze	Laboratory Analyst	Accuracy	Individual laboratory established limits per SOP
Sample splits and field duplicates	1 per 20 samples	None	Data assessor to inform PM if MPC is exceeded; address in data quality assessment	CDM Smith ASC	Precision	≤ 40% RPD (for results ≥ 5QL)
Surrogates	1 per 20 samples	25-120%R-warning limit 17-130%R-control limit	Investigate and correct	Laboratory Analyst	Accuracy/bias	25-120%R-warning limit 17-130%R-control limit
Temperature Blank	1 per cooler	0-6 degrees Celsius	Note outlier in laboratory narrative. Inform CDM Smith of failure and need for additional coolant; check packing procedure	Laboratory Analyst	Accuracy/ representativeness	≤ 10 degrees Celsius for data validation

Notes:
1. The assigned laboratory also must perform and meet all the measurement performance criteria that assess the analytical DQIs as specified in EPA Method 1613B.
2. The DLs referenced in the laboratory SOP are equivalent to the QLs or sample reporting limits.

QAPP Worksheet #28-c
QC Samples Table

Matrix	Aqueous
Analytical Group	Mercury (Total and dissolved)
Concentration Level	Trace (µg/L)
Sampling SOP(s)	See worksheet #21– split of CPG samples
Analytical Method/SOP Reference	EPA 1631 – Atomic fluorescence spectroscopy (SOP Hg-1631(2))
Sampler's Name	TBD
Field Sampling Organization	CDM Smith
Analytical Organization	Microbac
No. of Sample Locations	See worksheet #20 and 18

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits*	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Sample splits and Field Duplicate	1 per 20 samples	20% RPD	Notify PM and address in data quality report	CDM Smith ASC and PM	Precision	≤ 40% RPD (for results ≥ 5QL) or ABS≤QL
Temperature Blank	1 per cooler	0-6 degrees Celsius	Note in laboratory narrative. CDM Smith will use more coolant; check packing procedure	CDM Smith FTL	Accuracy/ representativeness	≤ 10 degrees Celsius for data validation
Field Rinsate Blank	1 per decontamination event not to exceed 1 per day	≤ QL	Verify results; re-analyze. Flag outliers. Check decontamination procedures.	Laboratory analyst / CDM PM	Accuracy / Contamination	≤ QL
Preparation Blank (PB)	1 per 20 samples	No analyte > QL (greater of 0.4 ng or <0.1xsample)	Suspend analysis; redigest and reanalyze if sample<10*blank result	Laboratory Analyst	Accuracy	No analyte > QL
Laboratory duplicate	1 per 20 samples	Per laboratory SOP	Investigate and correct; Flag outliers; Note in case narrative. Multiple failures require re-distillation and reanalysis.		Precision	≤ 35% RPD if result >5QL
Certified Reference Material (Quality Control Sample) or Ongoing Precision and Recovery Samples	1 per 20 samples or 12-hour shift	Per laboratory SOP	Check calculations and instruments, reanalyze affected samples. Report in case narrative.		Accuracy/Precision	70-130%R for OPR/CRM <20 RSD for IPR 75-125%R for IPR
MS/D	1 per 20 samples or with each group of field samples	Per laboratory SOP	Investigate matrix effects and note in data narrative.		Accuracy	70-130%R
					Precision	RPD ≤35% (30 per method)

Notes: *- The laboratory SOP references the limits in the Laboratory Information Management System (LIMS) which are the internal laboratory control limits.

QAPP Worksheet #28-d
QC Samples Table

Matrix	Aqueous
Analytical Group	Wet Chemistry – DOC-Carbon analyzer + IR or FID detector
Concentration Level	Low (mg/L)
Sampling SOP(s)	See worksheet #21 – split of CPG samples
Analytical Method/SOP Reference	Standard Method 5310B (DESA SOP C-83 Modified)
Sampler's Name	George Molnar or TBD
Field Sampling Organization	CDM Smith
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20 and 18

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank /Calibration Blank	1 per 20 samples	< QL	If samples non-detect or if lowest sample result is >10 times the blank-no action; otherwise redigest /reanalyze. Flag results or modify reporting limit.	DESA	Accuracy/ Sensitivity	No analyte > QL
ICV/CCV	1 per batch of 10 samples	85-115%R	Suspend analysis, find cause, and reanalyze associated samples	DESA	Accuracy	85-115%R
Laboratory Duplicate	All samples duplicated	≤ 20% RPD if values >5QL; otherwise ABS≤5QL	Flag outliers	DESA	Precision	RPD ≤ 20% if values >5QL; otherwise ABS≤5QL
Matrix Spike	1 per batch of 20 samples	80-120%R	Flag outliers	DESA	Accuracy	80-120%R
LCS/ Quality Control Sample	1 per batch of 20 samples	80-120%R	Identify source of problem, recalibrate if needed/ make other adjustments and reanalyze or flag outliers	DESA	Accuracy	80-120%R or as stipulated stipulated by manufacturer or laboratory
LCS or Quality Control Sample Duplicate		RPD ≤ 20%			Precision	RPD ≤ 20%
Sample splits and Field Duplicates	1 per 20 samples or per event	None	Data assessor to inform PM if MPC is exceeded; flag results in report	CDM Smith ASC	Precision	≤ 40% RPD if >5xQL; otherwise ABS≤QL
Temperature Blank	1 per cooler	0-6 degrees Celsius	Note outlier in laboratory narrative. Inform CDM Smith of failure /need for additional coolant; check packing steps	DESA	Accuracy/ representativeness	≤ 10 degrees Celsius for data validation

Notes: Sample Splits performance criteria are outlined on Worksheet # 11.

QAPP Worksheet #28-e
QC Samples Table

Matrix	Aqueous
Analytical Group	Wet Chemistry – POC-Carbon analyzer + IR or FID detector
Concentration Level	Low (mg/L)
Sampling SOP(s)	See worksheet #21 – split of CPG samples
Analytical Method/SOP Reference	MCAWW EPA Method 415.1 (DESA SOP C-88 Modified)
Sampler's Name	George Molnar or TBD
Field Sampling Organization	CDM Smith
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20 and 18

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank /Calibration Blank	1 per batch of 20 samples or less	< QL	If samples non-detect or if lowest sample result is >10 times the blank-no action; otherwise redigest and reanalyze. Flag results or modify reporting limit.	DESA	Accuracy/Sensitivity	No analyte > QL
Laboratory Duplicate	All samples duplicated	Per DESA SOP	Flag outliers	DESA	Precision	RPD ≤ 20 if values >5xQL otherwise ABS ≤QL
ICV/CCV	ICV-prior to samples; CCV 1 per batch of 10 samples or every 12 hours	85-115%R	Suspend analysis, find cause, and reanalyze associated samples	DESA	Accuracy	90-110%R
Laboratory Control Sample/Analytical Quality Control	1 per batch of 20 samples or less	80-120%R or as supplier certified	Identify source of problem, re-prepare and re-analyze or flag outliers	DESA	Accuracy	80-120%R or as supplier certified
Laboratory Control Sample/Analytical Quality Control Duplicate		RPD ≤ 20%			Precision	RPD ≤ 20%
Sample splits and Field Duplicate	1 per 20 samples per event	None	Data assessor to inform PM if MPC is exceeded; flag results In report	CDM Smith ASC	Precision	RPD ≤ 40% if >5xQL otherwise ABS ≤QL
Temperature Blank	1 per cooler	0-6 degrees Celsius	Note outlier in laboratory narrative. Inform CDM Smith of failure and need for additional coolant; check packing procedure	DESA	Accuracy/bias	≤ 10 degrees Celsius for data validation

Notes: Sample Splits performance criteria are outlined on Worksheet # 11.

QAPP Worksheet #28-f
QC Samples Table

Matrix	Aqueous
Analytical Group	Wet Chemistry – SSC (TSS)-Oven / Balance
Concentration Level	Low/Medium (mg/L)
Sampling SOP(s)	See worksheet #21 – split of CPG samples
Analytical Method/SOP Reference	Standard Method 2540D (DESA SOP C-33 Modified)
Sampler's Name	George Molnar or TBD
Field Sampling Organization	CDM Smith
Analytical Organization	As per FASTAC [DESA or Subcontract Laboratory]
No. of Sample Locations	See worksheet #20 and 18

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation/ Method Blank	1 per batch of 20 samples	None	If samples non-detect or if lowest sample result is >10 times the blank-no action; otherwise reanalyze and qualify data	DESA	Accuracy/Sensitivity	No analyte > QL
Laboratory Duplicate	1/20 or per batch	Per laboratory SOP, ≤ 20 RPD	Flag outliers	DESA	Precision	≤ 20 RPD; ABS ≤QL for samples <5x QL
Sample splits and Field Duplicates	1 per 20 samples or per event	None	Data assessor to inform PM if MPC is exceeded; flag results In report	CDM Smith ASC	Precision	≤20% RPD if > 5xQL otherwise ABS ≤QL
Laboratory Control Sample or Quality Control Sample	2 per batch of 20 samples	Average Recovery within the standard manufacture's limits or method limits; % RPD < 20	Identify source of problem, re-prepare and re-analyze or flag outliers	DESA	Accuracy	80-120%R or as stipulated stipulated by manufacturer or laboratory
Laboratory Control Sample or Quality Control Sample Duplicate				DESA	Precision	≤20% RPD
Temperature Blank	1 per cooler	0-6 degrees Celsius	Note outlier in laboratory narrative. Inform CDM Smith of failure and need for additional coolant; check packing procedure	DESA	Accuracy/bias	≤ 10 degrees Celsius for data validation

Notes:
Sample Splits performance criteria are outlined on Worksheet # 11.

QAPP Worksheet #29
Project Documents and Records Table

Sample Collection Documents and Records	On-Site Analysis Documents and Records	Off-Site Analysis Documents and Records	Data Assessment Documents and Records	Other
Scribe Traffic Reports/ COC Records	No on-site analysis will be performed	Sample Receipt, Custody and Tracking Logs	Corrective Action Reports	Purchase Requisition Forms
Airbills	Logbook Notes	Standards Tracking Logs	Analytical sample results	Laboratory SOPs
Sample Tracking Log/Sheets	Photographs	Corrective Action Reports	Laboratory certifications	Technical/QA Review Forms
Logbooks	No on-site analysis will be performed	Corrective Action Forms	Laboratory QA Plan (on file with EPA and CDM Smith)	ANSETS Report Forms
Daily Summary Report via e-mail		Data Packages (Case Narratives, Sample Results, QC Summaries and Raw Data (detailed in SOPs).	QC Audit Reports Data Validation SOPs Data Validation Reports	Telephone Logs
Field Change Request Forms		Trip Reports	Data Package Completeness Checklist Validated Data Reports	Electronic Data Deliverables
Custody Seals		Sample analysis run logs	Self Assessment Checklist	Non-Conformance Reports
ANSETS Forms		Sample Receipt, Custody and Tracking Logs		

QAPP Worksheet #30
Analytical Services Table

Matrix	Analytical Group	Concentration Level	Analytical SOP	Data Package Turnaround Time[1]	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/ Organization (Name and Address, Contact Person and Telephone Number)
Aqueous	PCDD/PCDF	Low	EPA 1613B/ Axys SOP MLA-017	21 days (7 days /14 days)	AXYS Analytical Services Ltd. 2045 Mills Road West Sidney, BC V8L 5X2, Canada 1-888-373-0881	TBD
	PCB Congeners	Low	EPA 1668A/ Axys SOP MLA-010			
	Total and Dissolved Mercury	Low	EPA 1631	21 days (7 days /14 days)	Microbac Laboratories, Inc. 250 West 84th Drive Merrillville, IN 46410 Attention: Kevin Falvey 219-769-8378	TBD
	Suspended Solids (TSS)	Low	SM2540D (DESA SOP C-33 Modified)	21 days (7 days /14 days)	DESA Primary contact: RSCC Adly Michael/Bob Toth 732-906-6161/6171 DESA contact: John Birri 732-906-6886	Master Services Agreement Subcontract Laboratory (TBD)
	DOC	Low	SM 5310B (DESA SOP C-83 Modified)			
	POC	Low	SM 5310B/ 415.1 (DESA SOP C-88 Modified)			

Notes:

1: Subcontract laboratories will communicate with the ASC on split sample status and potential analytical difficulties (if any arise). With the approval of the ASC, the turn-around-time for the laboratory data package deliverable can be adjusted to account for re-analysis or additional quality control as necessary.

QAPP Worksheet #36
Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria[1, 2]	Data Validator (title and organizational affiliation)
IIa /IIb	Aqueous	PCDD/PCDF	Low	EPA SOP HW-19 or 25, Validating PCDD/PCDF by HRGC/HRMS, Revision 1 or National Functional Guidelines	CDM Smith ASC, Scott Kirchner or designee
IIa /IIb		PCB Congeners	Low	Data Validation Guidelines SOP HW-46, rev 0 or National Functional Guidelines	
IIa /IIb		Mercury	Low/Medium	National Functional Guidelines modified by QAPP Worksheets 12,15,19 and 24	
IIa /IIb		TOC	Low	DESA validation SOP – Data evaluation will review against QAPP measurement performance criteria	DESA
IIa /IIb		DOC	Low		
IIa /IIb		POC	Low		
IIa /IIb		TSS/ Suspended Solids Concentration	Low		

Notes:

1. DESA laboratory results will be validated by EPA staff.
2. Subcontract laboratory results will be validated by the process of data verification and assessment utilizing the laboratory QC summaries.
3. All validation procedures will utilize the measurement performance criteria in the QAPP and any additional method requirements.

QAPP Worksheet #37
Usability Assessment

The Data Comparability Report will be prepared by CDM Smith personnel. Frank Tsang, Task Order Manager, will be responsible for its content and for assigning work to the CDM Smith personnel who will be supporting this assessment. The data comparability review and usability assessment will be conducted on validated data. The effectiveness of control actions will be evaluated during the laboratory review of the data, data validation and data evaluation and data quality assessment process. Data information will be documented in the laboratory narrative, data validation report and in the Data Comparability Report. The report will include an overall assessment of the CPG's analytical data using the results of the split sampling and field oversight including the field oversight observations of deficiencies and compliance; and an assessment of the split sampling data quality. The following items will be assessed for CDM Smith split samples and conclusions drawn based on their results:

Precision – Split samples will be compared using the RPD for each pair of results reported above QL. As appropriate, alternative data comparisons will be used. Additional information on data handling is included on Worksheet #11 under the section titled "What will the Data be Used for".

Results of laboratory duplicates will be assessed during data validation and data will be qualified according to the data validation procedures cited on Worksheet #36. RPD acceptance criteria of less than or equal those listed in this QAPP will be used to access sampling precision. Absolute difference will be used when one or both results are at or below the QL. An absolute difference of less than five times the QL will be the acceptance criteria. A discussion summarizing the results of laboratory precision and any limitations on the use of the data will be described in the report.

Accuracy/Bias Contamination – Results for all laboratory blanks will be assessed as part of the data validation. During the validation process, the validator will qualify the data following the procedures described on Worksheet #36. A discussion summarizing the results of laboratory accuracy and bias based on contamination will be presented and any limitations on the use of the data will be described in the report.

Overall Accuracy/Bias – The results of instrument calibration and surrogate spike recoveries will be reviewed and data will be qualified according to the data validation procedures cited on Worksheet #36. A discussion summarizing the results of laboratory accuracy and any limitations on the use of the data will be described in the report.

Sensitivity – Data results will be compared to project action limits provided on Worksheet #15 of this QAPP Addendum and Worksheet #15 of QAPP Addendum 8. A discussion summarizing any conclusions about sensitivity of the analyses will be presented, and any limitations on the use of the data will be described in the report.

Representativeness – A review of adherence to field procedures and of project QA audits will be performed in order to assess the representativeness of the sampling program. Data validation narratives will also be reviewed, and any conclusions about the representativeness of the data set will be discussed.

QAPP Worksheet #37

Usability Assessment

Comparability –The results of this study will be used in conjunction with the CPG's data to support the investigation results. The data will be collected, analyzed and reported in a manner that is comparable to the CPG's data set. The RPD between CDM Smith's and the CPG's data will be calculated.

Completeness – A completeness check will be done on analytical data generated by the laboratories. Completeness will be calculated for each analyte and compared to the project completeness goal of 90 percent. For sampling, completeness will be calculated as the number of samples collected and analyzed divided by the number of planned for collection. For each analyte, completeness will also be calculated as the number of data points that meet measurement performance criteria divided by the total number of data points for that analyte. A discussion summarizing the results of project completeness and any limitations on the use of the data will be described in the report.

Reconciliation – The PQLGs presented in Worksheet #12 will be examined to determine if the objectives were met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of major impacts observed from data validation, data quality indicators and measurement performance criteria assessments. Based on the results of these assessments, the quality of the data will be determined. Based on the quality determined, the usability of the data for each analysis will be determined. Based on the combined usability of the data from all analyses for an objective, it will be determined if the PQLG was met and whether project goals were achieved. As part of the reconciliation of each objective, conclusions will be drawn and any limitations on the usability of any of the data will be described.

The following equations will be used:

1. To calculate split sample precision: RPD = 100 * 2 |X1 - X2 | / (X1 + X2)

   where X1 and X2 are the reported concentrations for CPG's sample and CDM Smith split sample /field duplicate

2. To calculate split data completeness:

   % Completeness = V/n * 100 - where V= number of measurements judged valid; n = total number of measurements made and

   % Completeness = C/x * 100 - where C= number of samples collected; x = total number of measurements planned

The investigation results will be presented in tables and figures and in the text of the Data Comparability Report. Data gaps will be evaluated if requested by USACE/EPA. The report will discuss the completeness of the planned and collected data and the affect on the data objective of evaluating the accuracy of the CPG's data.

References:

CDM Federal Programs Corporation (CDM Smith). 2010. *Final Quality Assurance Project Plan Physical Water Column Monitoring and Generic Information for Upcoming Tasks*. March 10.

_____. 2011. *Revised Final Quality Assurance Project Plan, Addendum #8, Chemical Water Column Monitoring Study/Small Volume Chemical Data Collection.* November 21.

AECOM. 2011. Lower Passaic River Restoration Project. Lower Passaic River Study Area RI/FS. *Quality Assurance Project Plan/Field Sampling Plan Addendum. Remedial Investigation Water Column Monitoring/Small Volume Chemical Data Collection*. Revision 1. July 2011.

CH2M Hill. 2013. Lower Passaic River Restoration Project. *Quality Assurance Project Plan. Remedial Investigation Water Column Monitoring/Small Volume Chemical Data Collection Addendum A Water Quality Monitoring for the River Mile 10.9 Removal Action.* Revision 0. July 1.

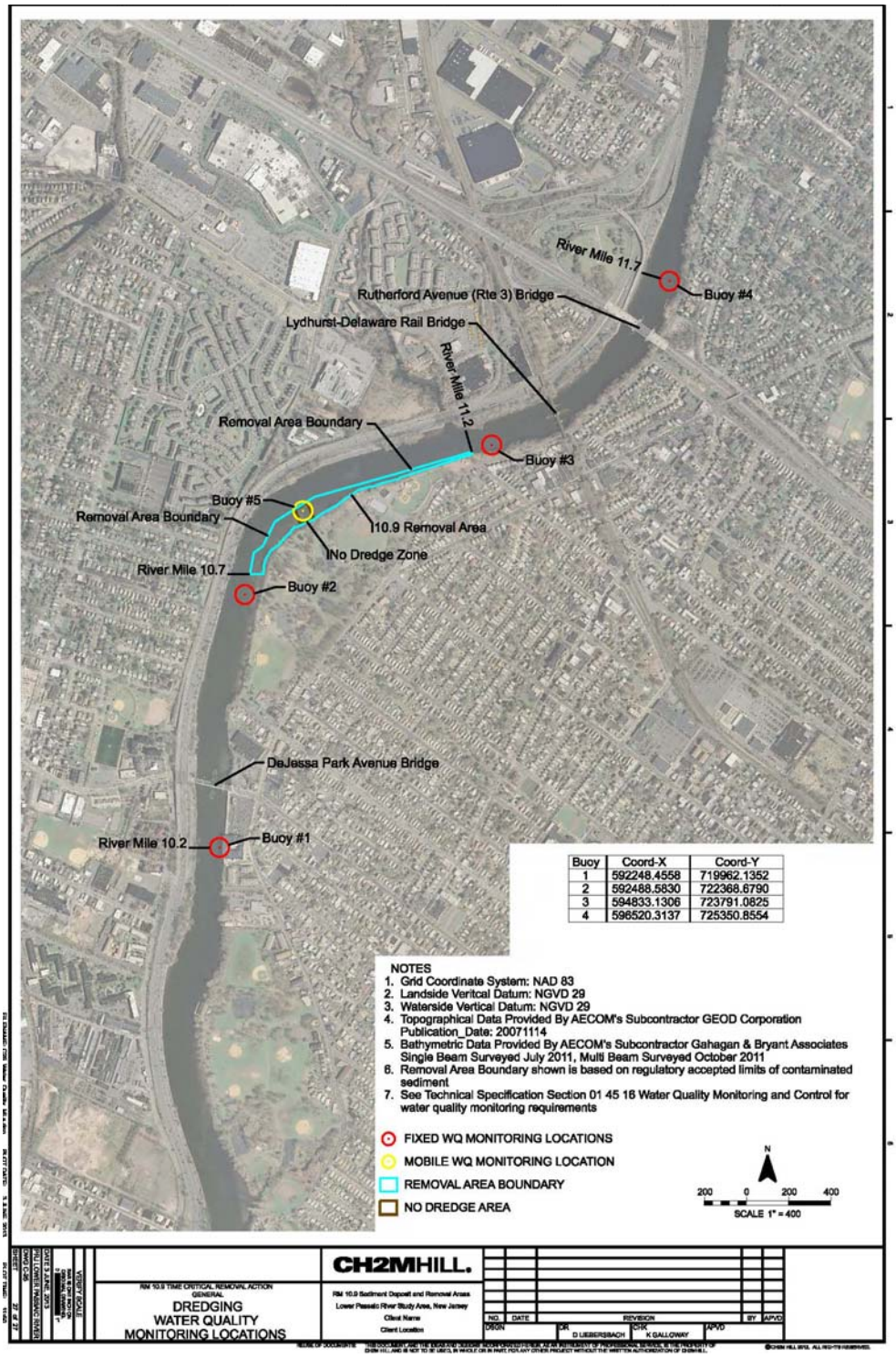

Figure 1: Water Quality Monitoring Locations